DOCUMENT RESUME

ED 428 179	CE 078 029
AUTHOR	Balschweid, Mark A.; Thompson, Gregory W.; Cole, R. L.
TITLE	Agriculture and Science Integration: A Pre-service Prescription for Contextual Learning.
PUB DATE	1998-06-01
NOTE	13p.; Paper presented at the American Vocational Association Convention (New Orleans, LA, December 10-13, 1998).
PUB TYPE	Reports - Research (143)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Agricultural Education; Educational Research; Experiential Learning; Higher Education; *Integrated Curriculum; Masters Degrees; Masters Programs; *Preservice Teacher Education; *Science Instruction; Secondary Education; Student Teaching; Teaching Methods; Vocational Education Teachers

ABSTRACT

A pre-experimental, static-group comparison study explored effects of delivery of an integrated agriculture and science curriculum to six students in the 1996-97 agricultural education Master of Arts in Teaching (MAT) cohort at Oregon State University. The control group contained 15 members of the previous 5 cohorts currently teaching secondary agricultural education. The treatment was administered in three phases; after each one, students were interviewed. During the 1996 fall term, students were enrolled in a micro-teaching class in which they did the following: viewed sample agriculture lessons including scientific principles; were taught methods of integration; developed and delivered lessons containing scientific principles within the agricultural context; and viewed and evaluated the lessons. During their 1997 winter term of student teaching, control group members were required to do the following: deliver a science-based lesson; establish contact with a science teacher and observe him or her; and borrow equipment or supplies for use in the agricultural classroom. During the 1997 spring term, the treatment group attended a 1-week job shadowing/team-teaching experience. In December 1997, a survey was completed by 19 members of the 6 cohorts from 1991-97 who were teaching agricultural education. The treatment group initially estimated they would include 74 percent of science content in agricultural education; after student teaching, the mean response was 54 percent. They felt that personality was important to successful collaboration but a common teaching style was not. Both groups rated time as the greatest barrier to integration. (Contains 13 references.) (YLB)

ED 428 179

AGRICULTURE AND SCIENCE INTEGRATION: A PRE-SERVICE PRESCRIPTION FOR CONTEXTUAL LEARNING

Mark A. Balschweid
Assistant Professor
Agricultural Education
Department of Curriculum and Instruction
Purdue University
1442 Liberal Arts and Education Building
West Lafayette, Indiana 47907-1442
Phone: (765) 494-7290
FAX: (765) 496-1622

Gregory W. Thompson
Assistant Professor
Agriculture Education and General Education
112 Strand Agriculture Hall
Oregon State University
Corvallis, Oregon 97331-2212
Phone: (541) 737-1337
FAX: (541) 737-2256
e-mail: thompsgr@ccmail.orst.edu

R. L. Cole
Professor
Agriculture Education and General Education
112 Strand Agriculture Hall
Oregon State University
Corvallis, Oregon 97331-2212
Phone: (541) 737-1336
FAX: (541) 737-2256
e-mail: colel@ccmail.orst.edu

June 1, 1998

Agriculture and Science Integration:
A Pre-service Prescription for Contextual Learning

Introduction

In response to the National Academy of Sciences report on the status of agricultural education in the 1980's, the agricultural education community joined forces and developed *A National Mobilization Plan for Revolutionary Change in Agricultural Education* (The Strategic Plan for Agricultural Education, 1989). The plan included a resolution to expand the network of relationships between agricultural education and science. This idea was formulated to encourage the integration of science into the agriculture curriculum to allow agriculture courses to meet requirements toward high school graduation and university admittance requirements, something that vocational agriculture had never done.

Appealing to a broad audience with various motives for enrolling in agriscience courses should be the driving force in agriculture programs. In considering all students who would be interested in taking an applied science course, it is necessary to evaluate every phase of an agriculture program and make changes in areas that don't welcome students from all backgrounds, rather than just those with farming interests.

Recent research has focused on the benefits of an agriscience curriculum. Connors and Elliot (1994) found that Michigan teachers agreed that the agriscience curriculum was useful and should be recommended to all high school students. In Mississippi (Newman & Johnson, 1993) teachers felt science credit should be awarded for agriscience courses. Agriscience teachers had worked more closely with science teachers since the implementation of the pilot agriscience courses, and most importantly, Mississippi pilot agriscience teachers and science teachers shared resources to a greater extent than teachers nationally.

Furthermore, research findings have supported the claim that integration of science into the agriculture curricula is a more effective way to teach science. Students taught by integrating agriculture and scientific principles demonstrated higher achievement than did students taught by traditional approaches (Enderlin & Osborne, 1992; Enderlin, Petrea, & Osborne, 1993; Roegge & Russell, 1990; and Whent & Leising, 1988).

Although collaboration is being sought from many different directions, the reality and feasibility of such a task are often inconceivable. Differences exist in many school districts that inhibit the ability of teachers to collaborate and integrate their curricula (Hickey, 1994). The questions which need to be asked may not be how long teachers have worked together or how much time they have to collaborate, but rather, how *willing* are they to work together with their peers, and have they been *taught* how to collaborate by either pre-service or in-service training?

Objectives

The purpose of the study was to determine if the delivery of an integrated agriculture and science curriculum to the Agricultural Education MAT (Master of Arts in Teaching) students at Oregon State University, increased their desire and ability to integrate their curriculum and collaborate with other teachers once they started teaching, and to identify social and cultural barriers in existence between secondary teachers in agriculture and science.

Procedures

The design of the study was pre-experimental, static-group comparison (Gall, Borg and Gall, 1996, p.507). The research study used a combination of qualitative and quantitative analysis in order to utilize the strengths of each research methodology (Reichardt and Rallis, 1994). Specifically, the research combined a series of personal interviews with the treatment group in addition to the written questionnaire administered to both the treatment and control groups. The treatment was administered in three phases during the 1996-97 academic year. Observations were timed to occur either during or after each phase of the treatment. During the 1996 fall term students were enrolled in a micro-teaching class. Students viewed sample agriculture lessons that included scientific principles, and were taught methods of integrating scientific principles into their own lessons. Then, the students themselves developed and delivered lessons that contained scientific principles within the agricultural context. Finally, students viewed the lessons of their cohort members that integrated science and had the opportunity to evaluate those lessons for content, delivery and methodology. Interview #1 took place during the 1996 fall term.

During the 1997 winter term, the teacher preparation cohort members were teaching at their student teaching sites. The student teachers were required to deliver a science-based lesson to an AST (Agricultural Science and Technology) class. In addition, they were required to establish contact with a science teacher in their building and observe that teacher in the classroom setting. Finally, the student teachers were required to borrow equipment and/or supplies from the science department for use in the agricultural classroom. Interview #2 occurred during the 1997 winter term.

During the 1997 spring term, members of the 1996-97 teacher preparation cohort were required to attend a one-week job shadowing/team-teaching experience at Portsmouth Middle School in downtown Portland, Oregon. The teachers selected for observation and interaction were science/mathematics teachers from the metropolitan middle school. Interview #3 occurred during spring term of 1997 following the Portsmouth Middle school experience.

The population for the treatment group, and the qualitative portion of the study, consisted of six graduate students enrolled in the 1996-97 MAT (Master of Arts in Teaching) agricultural education cohort at Oregon State University. Due to the size of the population, all members of the cohort were included in the study. The subjects representing the control group, and involved in the quantitative analysis of the study, were members of the previous five MAT agricultural education cohorts at Oregon State University. Beginning in 1991-92 with the first cohort and continuing through 1995-96, thirty-three students completed the Agricultural Education MAT program and became eligible for teaching employment. Due to the size of the population, all fifteen members of the previous cohorts who were currently teaching secondary agricultural education were included in the quantitative analysis of the study.

The final data collection occurred in December of 1997 with a mailed questionnaire. The survey was sent to all members of the six agricultural education teacher preparation cohorts from 1991-97 who were teaching agricultural education. The questionnaire consisted of three sections. Section one contained eight statements concerning the integration of science into the agriculture curriculum. Teachers were asked to rate each statement concerning curriculum integration using an ordinal scale regarding the *importance* they placed upon the statement. A similar scale was used to determine their level of *involvement* with the contents of the statement. Section two contained twelve statements concerning potential barriers that could exist between science and agriculture teachers.

The instrument used in the study was submitted to a panel of experts consisting of agriculture teachers and university professors who reviewed it for content validity. Refinements were made in the draft instrument consistent with panel input to improve content validity. The instrument was pilot tested in October of 1997 by eight Agricultural Science and Technology teachers in Oregon who were not part of the study. The purpose for the field test was to establish reliability and to obtain additional feedback concerning validity of the instrument from practicing teachers. Cronbach's coefficient alpha was used to calculate the internal consistency of the instrument. Reliability for the ordinal and Likert-type sections of the instrument was calculated from the field test at $\alpha=0.867$ (reliability post hoc $\alpha=0.852$). Minor changes were made to the instrument based upon the results and recommendations of the pilot test group. The survey instrument and cover letter were mailed to fifteen teachers in the control group and four teachers in the treatment group for a total of nineteen teachers. Two of the original six members of the treatment group did not enter the teaching profession as a secondary agricultural education instructor and therefore were eliminated from the survey portion of the research.

All subjects returned the survey for a 100 percent response rate. Frequency counts, percentages, means and standard deviations were used for analyzing the data. No predictive statistics were used for this study since the survey groups involved were the population. Gall, Borg & Gall (1996, p. 389) state when small samples are studied ($N<29$) it is advisable to use the t-test. Therefore, the statistical comparison for the tests between the control and treatment groups was set a-priori using a two-tailed t-test at alpha <0.05. To control for the equality of variance between the control and treatment groups, Levene's test for equality of variance was used. When the p-value for Levene's test was <0.05, the two-tailed significance was calculated on unequal variance between the two groups (Ramsey & Schafer, 1997, p.99).

Qualitative Findings

Two types of results were gathered during this study: qualitative and quantitative. The qualitative data yielded findings from interviews conducted only with the treatment group. Although the results from the interview series were used to guide the development of the questionnaire used in the quantitative portion of this study, the responses to the interviews also yielded useful data pertinent to this study.

When the respondents in the treatment group were initially asked to estimate their perception of how much science should be integrated into the agriculture curriculum, the mean response for percentage of science they would include was 74%. When asked the same question three months later, after they had been involved in student teaching at their assigned school, the mean response was 54%. Reasons given for the decrease in the perceived amount of science integrated into the agriculture curriculum included the amount of time needed by the AST teachers to incorporate science and the desire to be sure they could teach the scientific principles accurately. Further comments included:

> *The only thing is that hands-on experiments take time. There is a lot of things that I realize you just have to plow straight through and give them other information. If I'm going to be truthful I'm going to say science has to be about twenty percent if you're going to include everything else. (F1)*

Respondents in the treatment group were asked for their perceptions concerning how receptive they thought the science teachers at their school were regarding their attempts to infuse science into the agriculture curriculum. Three out of the four (75%) respondents indicated a favorable impression of the science teacher in response to their efforts to integrate scientific principles into the agriculture curriculum. The subjects in the treatment group were asked if it was important for them to "like" the science teacher in their respective schools. Every respondent in the group indicated that it was important. Comments included:

> *I think that it's absolutely essential. Because if you can't work with them, and for instance you want to have science credit in your classroom, they'll never allow it. (F3)*

> *It's hard. I know since this is confidential I can say this: if I had to work with at least one of the people here, specifically, I don't think I could do it. I really don't. Just because of the differences. (M1)*

Subjects in the treatment group were asked if they perceived any drawbacks to integrating science into the agriculture curriculum or collaborating with science teachers:

> *It requires time and resources. It takes time on my part to be sure of what I'm saying to the kids. I think the time is a big factor... and 'turfism'. (F1)*

> *If you're going to be teaching science principles you have to understand the fundamentals and how they relate to agriculture. You might be a fantastic agriculture teacher, but you basically have to know your science. I don't think you could be a great agriculture teacher and slide by in science and get science credit for your program. (F4)*

Interview #3 occurred after the conclusion of the treatment phase of the study. Therefore, the student teachers were asked if, as a result of working with science teachers during the year, their desire to continue collaborative efforts with science teachers at the school they would be teaching at upon graduation, had increased or decreased? The comments included:

I wish I could help you out but I really feel like most of what I've done is prep for becoming a new teacher and I haven't really looked at integration on my own part. I mean it's interesting, and it's great, but that first year is looming and I've got a lot of work to do, so I'm not considering it at this time. (F1)

It's going to be a lot more work. In that first year of teaching I'll be just trying to get the basics out without stumbling too much, you know. And if I'm trying to do FFA and SAE it might be one of the last things on my list, unfortunately, when it should be one of the first things. (M1)

The treatment group was asked if they felt confident in their ability to integrate scientific principles into their agriculture curriculum and to collaborate with the science teacher when they arrived at the school where they were hired. Four out of five (80%) responded with words such as "definitely" and "confident" that they could accomplish this task. Finally, the subjects in the treatment group were asked how long they felt it would take before they would be willing to integrate science and to think about ways to collaborate with science teachers at the schools where they were hired. Three out of five (60%) responded it would be at least three years. One (20%) subject responded with "at least the second, if not the third year." Further comments included:

It's going to take three to five years to feel comfortable with what I'm doing so that I can feel comfortable enough to step out of my comfort zone and work with other teachers. I'll continue anything that the department has going, but beyond that I wouldn't want to start anything new. (F1)

I don't know if you could ever integrate everything. You could be working on it for years. I don't really think it's a final place you reach. I think it's a never-ending pursuit. But I think after about three years you should have a basic element in every area you want to implement it in. (F2)

Quantitative Findings

In addition to collecting information regarding teachers' desire and ability to integrate science into the agriculture curriculum the questionnaire sought to collect demographic information. Table one presents selected demographic characteristics of the treatment and control groups.

The average respondent in the control group reported three years of total teaching experience with an average age of 29.1 years, while the average teacher in the treatment group was in their first year of teaching and averaged 27.5 years of age. Fourteen of fifteen teachers (93%) in the control group had attended a workshop on agriscience while all teachers in the treatment group (100%) had attended a workshop on agriscience. Of the agriculture teachers surveyed, 87% (13) of the control group and 50% of the treatment group (2) responded that they had borrowed materials, supplies, and/or equipment from the science department in their school.

Table 1
Descriptive Statistics for Selected Demographic Characteristics of Treatment and Control Groups (N=19)

Characteristic	Treatment N	Mean	SD	Control n	Mean	SD
Age	4	27.5	2.6	15	29.1	4.8
Years of Teaching Experience	4	1.0	0.0	15	3.0	1.2
Number of Students in your school	4	1500	424.2	14	783	448.0
Number of Faculty in your school	4	93.2	58.7	12	47.8	42.1

Characteristic	Treatment N	Yes	No	Control n	Yes	No
Does your school give science credit for Agricultural Science and Technology courses?	4	3	1	15	8	7
Have you ever attended any workshops on agriscience?	4	4	0	15	14	1
Do you currently have a science endorsement?	4	0	4	15	1	14
If you do not have a science endorsement, do you plan to get one?	4	1	1	15	9	3
Do you share a common prep period with any of the science teachers in your school?	4	2	-	15	9	5

Question numbers one through eight of the questionnaire dealt with the *need* felt by secondary agricultural education teachers for incorporating scientific principles into the Agricultural Education Program through collaboration and integration efforts. For these questions, a five-point ordinal scale was used to assess the importance respondents placed on each statement. The choices for selection of importance were 1=Unimportant, 2=Below Average, 3=Average, 4= Above Average, and 5=Utmost. Of the eight statements listed, only the statement, "AST teachers should attend workshops on incorporating scientific principles into their curriculum", was statistically significant with a two-tailed p-value of 0.006, with treatment group teachers feeling most strongly in favor of attending agriscience workshops. The raw mean scores on the eight statements were the lowest, 3.33 and 3.25 for both the control and treatment groups respectively, for the statement "my AST curriculum should be reviewed by the science teacher(s) to ensure scientific principles are being taught accurately". The two questions which received the highest marks were "science teachers should be aware of the efforts to integrate science into AST programs within their building" (4.53 for the control group, 4.75 for the treatment group), and "AST instructors should attend workshops on incorporating scientific principles into their curriculum" (4.27 for the control group, 5.00 for the treatment group).

Question numbers one through eight of the questionnaire also asked for the respondents to rate their *involvement* in the statements listed concerning the concept of incorporating scientific principles into the Agricultural Science and Technology Program through collaboration and integration efforts. For questions one through eight, a five-point ordinal scale was used to measure the degree of involvement of the respondents with regard to each collaboration and integration statement. The choices for selection of involvement were 1=Never, 2=Seldom, 3=Sometimes, 4= Much of the time, and 5=Always. Of the eight statements in the questionnaire concerning teacher involvement in the collaboration and integration of scientific principles into the AST curriculum, none was found to be statistically significant. Teachers in the control group rated the statement, "AST teachers should integrate scientific principles into their lessons", higher than the other statements with a 4.00 indicating they were involved in it "much of the time". Meanwhile, the teachers in the treatment group rated their involvement with the statement, "science teachers should be aware of the efforts to integrate science into the AST programs within their building", higher than the other statements giving it a rating of 4.00. The lowest rated statement by both the treatment and control groups was "my AST curriculum should be reviewed by the science teacher(s) to ensure scientific principles are being taught accurately". This statement received a score of 1.75 from the treatment group and 2.13 from the control group indicating they were seldom involved with the activity.

The survey included twelve questions which asked the respondents to rate their perceptions of the existence of social and/or cultural barriers which inhibited their ability to collaborate with the science teacher(s) in their school and limited their ability to integrate science into their agriculture curriculum. The twelve questions asked respondents to make selections using a five-point Likert-type scale to indicate their perceptions of each statement. Respondents' choices were 5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree, and N/A=not applicable. Of the twelve statements listed, only, "a difference in years of teaching experience is a barrier in working with the science teacher(s) in my school", was statistically significant between the treatment and control groups with a p-value of 0.039 on a two-tailed t-test of independent means, with the treatment group rating this statement as a greater barrier than the control group.

Three open-ended questions asked respondents to provide information in detail regarding barriers that prohibit them from collaborating with the science teacher(s) in their building. When asked, "what do you feel is the greatest barrier to working with the science teacher(s) at your school?", three out of four respondents in the treatment group mentioned the time required. Five of the fifteen teachers in the control group responded to the same question by writing that time was the greatest barrier inhibiting them from collaborating with the science teacher in their school.

Respondents were asked to list any other differences they perceived as barriers that prevented them, or could prevent them, from working with the science teachers in their schools. The responses to this question were broader in range. Two out of the eight responses (25%) from the control group indicated that competition for the same students caused a barrier between the science teacher and the agriculture teacher when trying to collaborate and integrate scientific principles into the agriculture curriculum. One of the three responses (33%) to this question from the treatment group also stated competition for students as their answer.

When respondents in the control group were asked for barriers that existed that kept them from obtaining a science endorsement, six responses were given. All six included the time necessary to study and take the test as a barrier. Three of the four teachers in the treatment group also marked time as a barrier for obtaining their science endorsement. The money necessary to take the test for obtaining a science endorsement was listed as the second most commonly occurring response. Three out of six in the control group and one out of four in the treatment group listed money as a barrier to gaining their science endorsement.

Conclusions

The conclusions of this study were based on the responses of the agricultural education teacher preparation cohorts from 1991-97 currently teaching secondary agricultural education. Although other teacher training programs emphasize the integration of science into the agriculture curriculum, caution must be exercised when generalizing the results beyond the population.

When the respondents in the treatment group were initially asked to estimate their perception of how much science should be integrated into the agriculture curriculum, the mean response for percentage of science they would include was 74%. When asked the same question three months later, after they had been involved in student teaching at their assigned school, the mean response was 54%. Reasons given for the decrease in the perceived amount of science integrated into the agriculture curriculum included the amount of time needed by the AST teachers to incorporate science and the desire to be sure they could teach the scientific principles accurately. It can be concluded the drop in favoring integration reflects the reality of the time commitment required to become a good teacher. Integration was perceived as important, but becoming a good teacher had to come first.

When asked how important a common teaching style was to the success of collaboration efforts between agriculture and science teachers, all five (100%) treatment group teachers responded that it was not important to the success of the collaboration effort. Since all five also indicated it was important to "like" the science teacher in their building it can be concluded that personality appears more important to collaboration than teaching style.

Treatment group cohort members who received pre-service instruction on integrating science into the agriculture curriculum and in methods of collaboration with science teachers were confident of their ability to accomplish these tasks after becoming licensed teachers. However, at the conclusion of their student teaching experience, all treatment group teachers expressed concern that it would take at least one year, and most likely three years, before they could implement many of the integration and collaboration practices. Therefore, it may be concluded that given the schedule of teachers and the expectations placed upon them, integration will take time to emerge as a priority.

A difference in the number of years of teaching experience between the agriculture teacher and the science teacher was a statistically significant barrier when comparing the control and treatment groups. This indicates that younger, first-year agricultural education teachers may be reluctant to approach the science teachers in their school and may be intimidated by what they perceive as veteran science teachers who are much more knowledgeable about science than they are, and therefore conclude that the science teachers may be unwilling to collaborate with the agriculture teacher. It might also be concluded that new graduates perceive they were viewed as the "experts" in their field, and might be more reluctant to seek assistance from the science teacher realizing they run the risk of giving the impression they don't know all that they should. As a result, the evidence suggests that new graduates need to realize they are just beginning as teachers and they will need assistance during their first years of teaching.

In the open-ended questions concerning barriers to collaboration teachers in both groups indicated that the past history of the agricultural education program influenced the perceptions of the science teachers in their building towards the agricultural education program. This is in agreement with the conclusions of Osborne and Dyer (1995). Since many agricultural education programs face poor images due to past history, agriculture teachers could improve the reputation of the program by allowing science teachers to assist them in developing segments of the agriculture curriculum to capitalize on opportunities to repair severed ties and establish improved reputations.

Respondents in both the treatment and control groups rated time as the greatest barrier to integrating science into the agriculture curriculum and to collaborating with the science teacher on methods of integration. There is evidence that agriculture teachers need more preparation time for integrating science concepts into their curriculum and for collaborating with the science teacher in their school. This was the only barrier to receive a mean score greater than 4.00. This concurs with the findings of Thompson (1996).

When asked for additional barriers to collaboration, respondents from both groups indicated competition for the same students was a barrier perceived by agriculture teachers. The need for the same equipment at the same time the science teacher was using it was also a barrier inhibiting agriculture teachers from borrowing materials, equipment and supplies from the science department. Clearly, if communication between the science and agriculture teachers were increased concerning the coordination and timing of curricula taught within the year, the necessary supplies, materials, and equipment could be available when each of the teachers involved was ready to use them.

Only one teacher (7%) in the control group had obtained a science teaching endorsement, while no teachers in the treatment group indicated possessing a science endorsement. Finally, when asked if they planned on obtaining a science endorsement, nine out of the remaining fourteen teachers (64%) in the control group indicated they were planning to obtain an endorsement for teaching science in their state. This compared to only one out of the four (25%) respondents in the treatment group who expressed an interest in acquiring the science teaching endorsement. It may be that new teachers realize possessing certification in science is not what makes them successful in integrating science into their agriculture curriculum, but rather it's participation in in-service workshops and collaboration with their local science teacher that will give their students the strong, science based agricultural education they need.

Recommendations

1. It is recommended that the Agricultural Education Department at Oregon State University do follow-up integration and collaboration in-service workshops with graduates after they have completed two to three years of teaching experience to enhance science integration and science teacher collaboration efforts.

2. Increased emphasis should be placed on pre-service instruction about collaboration. This could include allowing pre-service science teachers to review the curriculum of pre-service agriculture teachers for scientific accuracy. Efforts should focus on reducing the time it takes for teacher preparation graduates to incorporate scientific principles into their agriculture curriculum and validation for accuracy. Teacher preparation faculty should focus on emphasizing this issue to students preparing to become Agricultural Science and Technology teachers encouraging them to ask questions of colleagues within their school buildings.

3. Agricultural education teacher preparation graduates should be encouraged to participate in activities at their building sites which would foster relationships with members of the science department and general faculty to increase the opportunities for collaborative endeavors and for overall marketing of the secondary agricultural education program.

4. Since secondary agricultural education teachers have extended summer contracts, district administrators should offer science teachers extended contract days for the purpose of allowing collaborative efforts between the agriculture and science teacher to take place without the time constraints and distractions that occur during the academic year.

5. Priority should be placed on communication strategies for teacher preparation graduates in agricultural education to educate the faculty at their school, especially the science teachers, on the mission and focus of the local Agricultural Education Program.

6. Science and agricultural education departments should coordinate the timing of curricula offered during the academic year so they can share resources without conflict.

7. The Agricultural Education Department at Oregon State University should consider offering a joint in-service workshop for agriculture teachers and their district's science teachers for increasing integration and collaboration.

References

Connors, J., & Elliot, J. (1994). Teacher Perceptions of Agriscience and natural resources curriculum. Journal of Agricultural Education, 35 (4), 15-19.

Enderlin, K. J. & Osborne, E. W. (1992). Student achievement, attitudes, and thinking skill attainment in an integrated science/agriculture course. Proceedings of the Nineteenth Annual National Agricultural Education Research Meeting. St. Louis, MO.

Enderlin, K J., Petrea, R. E., & Osborne, E. W., (1993). Student and teacher attitude toward and performance in an integrated science/agriculture course. Proceedings of the 47th Annual Central Region Research Conference in Agricultural Education. St. Louis, MO.

Gall, M. D., Borg, W. R. & Gall, J. P. (1996). Educational research: An introduction (6th ed.). White Plains, NY: Longman Publishers USA.

Hickey, J. G. (1994). The relationship of collaborative settings to social organizational factors in medium-sized Wisconsin secondary schools. Unpublished doctoral dissertation, University of Wisconsin-Madison.

Newman, M.E. & Johnson, D. M. (1993). Perceptions of Mississippi secondary agricultural teachers concerning pilot agriscience courses. Journal of Agricultural Education, 34 (3), 49-58.

Osborne, E. W. & Dyer, J. E. (1995). Attitudes of Illinois high school science teachers toward the agricultural industry and educational programs in agriculture. Proceedings of the 22nd Annual National Agricultural Education Research Meeting. Denver, CO.

Ramsey, F. L., & Schafer, D. W. (1997). The statistical sleuth: a course in methods of data analysis. Belmont, CA: Wadsworth Publishing Co.

Reichardt, C. S. & Rallis, S. F. (1994). The qualitative-quantitative debate: New perspectives. San Francisco, CA: Jossey-Bass Publishers.

Roegge, C. A. & Russell, E. B. (1990). Teaching applied biology in secondary agriculture: Effects on student achievement and attitudes. Journal of Agricultural Education, 31 (1), 27-31.

The strategic plan for agricultural education. (1989). Alexandria, VA: National FFA Center.

Thompson, G. W. (1996). Characteristics and implications of integrating science in secondary agricultural education programs. Unpublished doctoral dissertation, University of Missouri-Columbia.

Whent, L. S., & Leising, J. (1988). A descriptive study of the basic core curriculum for agricultural students in California. Proceedings of the 66th Annual Western Region Agricultural Education Research Seminar. Fort Collins, CO.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Agriculture and Science Integration: A pre-service prescription for contextual learning

Author(s): Mark Balschweid, Greg Thompson, Lee Cole

Corporate Source: Purdue University & Oregon State University

Publication Date: Dec. 9, 1998

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY ____ Sample ____ TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY ____ Sample ____ TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY ____ Sample ____ TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
1	2A	2B
Level 1	Level 2A	Level 2B
[X]	[ ]	[ ]
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) *and* paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here,→ please

Signature: [signature]
Printed Name/Position/Title: Mark Balschweid, Purdue Univ.
Organization/Address: 1442 LAEB Room LILO, W. Lafayette, IN 47907
Telephone: 765-494-7290
FAX: 765-496-1622
E-Mail Address: markb@purdue.edu
Date: 2-5-99

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

Acquisitions Coordinator
ERIC Clearinghouse on Adult, Career, and Vocational Education
Center on Education and Training for Employment
1900 Kenny Road
Columbus, OH 43210-1090

However, if solicited by the ERIC Facility, or if making an unsolicited contribution to ERIC, return this form (and the document being contributed) to: